MARINE MAMMAL BEHAVIORAL DISTURBANCE (MMBD) WORKING GROUP
Perot Systems Scituate, MA
9:00am to 4:00pm
6 May 2004

MEETING SUMMARY

ACTION: **Noise Disturbance Action Plan (NDAP)**
Nathalie Ward will complete the NDAP with the assistance of acoustic experts Peter Tyack, Darlene Ketten, and Chris Clark. The final Action Plan will be provided to Working Group (WG) members for final review and comment.

ACTION: **Whale Watch Action Plan (WWAP) Rationale describing Guideline Non-compliance**
Brian Hopper to develop a rationale to be included as Activity 1.1.C in the WWAP describing recent research showing whale watch guideline non-compliance throughout the Sanctuary.

ACTION: **MMBD Action Plan Disclaimer**
Ward to develop a disclaimer to add to the final Action Plan Drafts stating that all Action Plans developed by the MMBD WG can be applied to all marine mammals including but not limited to whales, seabirds, and turtles.

ACTION: **Abnormal Events**
Ward to develop language to add to the MMBD Actions Plans stating that Stellwagen Bank National Marine Sanctuary (SBNMS) will seek out assistance for dealing with abnormal events both man-made or natural.

MMBD WORKING GROUP MEMBERS: (March 2, 2004)

Name	WG Seat / Affiliation	Attendance
Regina Asmutis-Silvia	WG Chair – SAC	Present
Nathalie Ward	WG Team Lead – SBNMS	Present
Dave Slocum	Whale Watching – NEAq	Present
Scott McNeil	Commercial Shipping	Not Present
Ralph Pratt	Tuna Fishing	Present
Sharon Young	Conservation—HSUS	Present
Carole Carlson	Conservation—IFAW	Not Present
Erin Heskett (Alternate)	Conservation—IFAW	Not Present
Jack Kent	Recreational Boating—MMTA	Not Present
Dana Hartley	NMFS	Present
Brian Hopper	NMFS/NER	Present
Kim Amaral	Academic—WHOI	Present
Peter Scheifele	Academic—UCONN	Not Present

Technical Advisors		
Peter Tyack	Acoustic Technical Advisor	Present
Chris Clark	Acoustic Technical Advisor	Present
Darlene Ketten	Acoustic Technical Advisor	Present
Others Present		
Craig McDonald	SBNMS	
Ben Haskell	SBNMS	
David Wiley	SBNMS	
Andrea Bogoloni	URI Student	
Jennifer Collier	URI Student	
Jennifer Ghiloni	PSGS	

WELCOME, INTRODUCTIONS, AND ADOPTION OF AGENDA

Nathalie Ward and Regina Asmutis welcomed the WG members. Asmutis requested approval of the 2 March Meeting Summary; motion was made to accept the summary without further revision.

Due to the presence of the 3 Acoustic Technical Advisors (Peter Tyack, Chris Clark, and Darlene Ketten) a motion was made and accepted to re-arrange the agenda to focus on acoustic related discussions, presentations and the editing of the WG's Noise Disturbance Action Plan during the morning session and then focus on finalizing the other MMBD Action Plans during the afternoon session.

NEW BUSINESS

Broad Based Noise Disturbance Action Plan and Potential Research Opportunities
Acoustic experts Peter Tayck, Chris Clark, and Darlene Ketten engaged the WG in an open discussion regarding noise disturbance issues in an attempt to gain a better understanding of what is known and not known about the impacts of noise disturbance on marine mammals and to gain insight into how SBNMS can be used as a "laboratory" to answer some of the unknowns.

The following is a brief summary of the discussion as well as the questions and answers raised during the session.

Discussion 1: Noise is an ecosystem issue.
Tyack noted that noise is an issue that can affect an entire ecosystem and the Sanctuary presents and excellent opportunity to investigate noise impacts. By tracking both animal locations and noise disturbances you can develop a better picture of the dynamics of the overall ecosystem. He then suggested the development of a SBNMS Noise Consortium, whereby the Sanctuary would act as the noise data clearinghouse and hold open meetings for interested parties (i.e., industry, students and the public at large) to discuss the data, its impacts, and voice concerns. A program such as this would mark the first of its kind and could offer a host of opportunities for research.

Clark supported the idea but asked the WG to consider what it is they want to do with the data produced from this Consortium. He asked the group to consider what the sanctuary could/would do if data proved that whales are negatively impacted by noise and how would this information impact policy?

Question 1: Regarding the potential impact to policy, can SBNMS be considered an unbiased administrator of this type of information; and will it have the authority to take action on the information it administered?
Answer 1: The proposal to begin a Noise Consortium is completely compatible with the Sanctuary's missions, goals, and purpose. If the data presented a need for action the Sanctuary would be compelled to act.

Based on this discussion the WG agreed to re-develop the NDAP around a consortium for collection of marine acoustic data using the Sanctuary as an unbiased manager of the data. See the Action Plan Review section of this document for further details.

PRESENTATIONS

Acoustic Research – Pop-Up Buoys
Chris Clark, Technical Advisor, Cornell University

Information and interest in marine acoustics has grown significantly. Understanding acoustic resources (e.g., equipment, technology, and other agency resources) for marine monitoring and creating solutions for acoustic problems requires and integrated approach that evolves physical and biological oceanography, resource management and public education. Through this increased integrated, approach, sampling and monitoring of acoustic data over multiple spatial and temporal scales has given insight into whales (i.e.., individual and seasonal species counts, tracks of speed and direction) and noise in general (e.g., how it is impacted by weather, seismic surveying and surface ships).

Due to the collapse of the Soviet Union, scientists and researchers have gained access to a wide array of acoustic information from a network of passive acoustic equipment located throughout the Atlantic. Many noises have been detected using this passive gear, many of which cannot be ascribed to any particular species. However through the monitoring of this acoustic activity it is possible to track whales by the songs that they sing. It has been discovered that most of these songs are associated with food sources. Sound, especially low octave sound, can travel long ranges. Whales' voices and ears have evolved to send and receive sounds at specific water depths and this is how species communicate. However due to increased levels of noises some evidence suggest that whales have begun to shift their voices out of their traditional range in order to be heard. In many places noise has gone up by 2 orders of magnitude.

Whale sound monitoring is being conducted using both navy hydrophone arrays and pop-up buoys. Samples are restricted by the placement of the buoys and abilities of the hydrophones (hydrophones work best for detecting noises under 100htz). Currently within Cape Cod Bay much of the acoustic monitoring is focused on right whales. New pop-up buoys located in the bay have a right whale detection trigger. Studies using these buoys have correlated whale song, with whale sightings and zooplankton abundance. In addition, data show that Cape Cod Bay is exhibiting chronic noise levels that are actually high enough to drown out whale calls.

ACTION PLAN REVIEW

Action Plan drafts (Whale Watching, Noise, and Overflight), and Appendix C: Emerging Issues were provided to each WG member. Members were asked to openly discuss, comment, and modify Action Plans text as necessary. All new/modified information based on discussions were recorded using the track changes option in Microsoft Word.

Issues raised during the review session are noted below.

Noise Disturbance Action Plan (ND AP)
Based on discussion with acoustic experts Tyack, Ketten, and Clark the WG modified the existing ND AP to include the development of a consortium for noise data. It was decided that the SBNMS would be an excellent unbiased candidate to manage and monitor this data. Currently Cornell University has a data clearing house which could be used as a model to store and distribute Sanctuary related noise data. With the assistance of the experts the WG also modified potential noise related research projects.

A revised version of the ND AP has been included as Appendix A.

The following highlights the issues raised while redrafting the ND AP.

Issue 1: The Potential to be Viewed as the "Data Police"

> ***Comment:*** The WG felt it important that the Sanctuary not be considered the "data police." Projecting this view could impede peoples desire to use the data for research. However, while the group agreed that data should be easily accessible to interested parties, there was strong agreement that there should be a tiered system for users to both request and submit data. This will enable the Sanctuary to have an idea who is using the data and for what purposes as well as assure that the data is accurate.

Issue 2: Interference with traditional Fishing Methods

> ***Comment:*** The NMFS representative wanted to go on the record as expressing concern for the impacts of Strategies 1.1.A and 1.1.B in the WW AP. Their felling is that these two strategies will interfere with traditional methods of fishing and the WG should consider these implications. However, despite this expression of concern the WG decided to leave 1.1.A and 1.1.B as is.

Fishing Issues Action Plan (FI AP)
Ward lead a brief discussion surrounding the message and purpose of this FI AP. After reviewing the FI AP an additional strategy involving outreach and education was added.

A revised version of the FI AP has been included as Appendix B.

Whale Watching Action Plan (WW AP)
Several WG members submitted edits to the WW AP. Edits were reviewed and revisions were made as necessary to the WW AP. A revised version of the WW AP has been included as Appendix C.

The following highlights the issues raised while reviewing the WW AP.

Issue 1: Recommendations to Codify Current Whale Watch Guidelines

> ***Discussion:*** Several WG members are divided as to whether a recommendation should be made to codify current whale watching guidelines. Three rationales have been written to reflect each point of view:
>
> 1. Codify current guidelines to minimize the potential for behavioral disturbances.

2. Leave guidelines as guidelines on the grounds there is no scientific evidence or research that suggest behavioral disturbance is increased due to whale watching activity.
3. Codify guidelines to allow enforcement of rules based on a study that found evidence general of non-compliance to current guidelines.

Overflight Action Plan (OV AP)
After a brief review of the OV AP, WG members added a recommendation for the Sanctuary to conduct research to investigate the effects of shadows from overflight on whale behavior. A revised version of the OV AP has been included as Appendix D.

Emerging Issues
After a brief review of the Appendix C: Emerging Issues, WG members added "DOD Activities" and "Tuna Spotter Planes" to the emerging issues list. A revised version of Appendix C: Emerging Issues has been included as Appendix E.

FINAL COMMENTS

Meeting adjourned at 4:00 pm.

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MMBD.AG.6

Marine Mammal Behavioral Disturbance

Management Plan Review Working Group
Perot Systems — Scituate, MA
6 May 2004
9 A.M. to 4:00 P.M.

AGENDA

9:00 – 9:15	Welcome, Adoption of Agenda and Minutes
9:15 – 9:30	Old Business: Action Items
9:30 – 10:30	Acoustic Research—Pop-Up Buoys: Chris Clark, Technical Advisor
10:30 – 12:00	Noise Disturbance Research Recommendations: Discussion
12:00 – 12:30	*Lunch*
12:30 – 2:30	Noise Disturbance Action Plan: Discussion Peter Tyack, Technical Advisor Darlene Ketten, Technical Advisor
2:30	*Coffee Break*
2:45 – 3:15	Review: DRAFT Fisheries Issues Action Plan
3:15 – 3:30	Review: DRAFT Whale Watch Action Plan
3:30– 3:45	Review: DRAFT Overflight Action Plan
3:45 – 4:00	Next Steps and Summary
4:00	Adjourn

APPENDIX A: Noise Disturbance Action Plan

Action Plan: SBNMS Marine Mammal Behavioral Disturbance

MMBD WG Goal Statement
The goal of this working group is to devise a framework to assess and minimize behavioral disturbance to marine mammals, and to foster cooperation with cross-jurisdictional partners which affect those living marine resources.

SBNMS NOISE DISTURBANCE ACTION PLAN

2.C.1 and 2.C.4 Issue Addressed: Noise Disturbance to Marine Mammals
This action plan addresses issues of disturbance to whales caused by in-water anthropogenic noise. This includes: shipping, ecotourism, military, research and private vessels.

Public scoping identified particular concerns regarding impacts of vessel noise and other acoustics on marine mammals. Currently, SBNMS has no noise guidelines or regulations. The concerns from public scoping to be answered include:

2.C.1 Whale Watching Activity

1. Do cumulative whale watch activities increase noise pollution and amplify approach issues to unacceptable levels?
2. What research could inform decision-making and management?
3. How are other agencies or groups addressing the issues in a regional context and under what authority?
4. How can enforcement measures be ensured?

2.C.4 Impacts of Vessel Noise and Other Acoustics on Marine Mammals

1. What are the sources of noise pollution? What are the levels of noise pollution?
2. What are the deleterious effects of noise pollution on marine mammals (e.g. masking, etc)?
3. Should action be taken to mitigate noise pollution effects on marine mammals within Sanctuary boundaries?
4. What research could inform decision-making and management?

Noise Disturbance Goal Statement
The goal is provide a framework to assess and mitigate anthropogenic noise occurring at levels where behavioral disturbance is clearly evident.

Introduction and Evaluation of Issue

Noise levels in the ocean continue to rise each year (Andrew et al, 2002; Anderson et al, 1971; Ross, 1987). Although chronic and acute noise impacts are well studied in terrestrial animals, relatively little is known about how aquatic organisms may be impacted by this trend. Exposure to anthropogenic noise has the potential to impact cetaceans by masking biologically important sounds (such as communication), provoking avoidance (or attraction) behavior, causing temporary or permanent hearing damage and, in extreme cases, death (Richardson et al., 1995; Yost, 1994). Unfortunately, specific data with which to assess exposure and impact are generally presently limited and potentially difficult to obtain. While the

gross anatomy of the marine mammal ear is comparable to that of terrestrial mammals, the audiology is likely to be vastly different. Furthermore, we remain limited in our ability to detect and correctly interpret animal responses to such stimuli. Nevertheless, marine mammals have been shown to manifest behavioral changes in the presence of certain types of noise <<someone needs to insert whatever references were originally intended here>>. Furthermore, military sonar has been suspected in certain mass cetacean strandings, based on the timing of the events and the nature of the injuries observed <<refs>>.

There is presently no evidence for or against noise-related impacts to cetaceans in the SBNMS. However, given the potential for impact and the possibility that such impacts might not be obvious, it is appropriate for the sanctuary to carefully investigate this issue within its boundaries. Commercial, recreational, military and research vessels all contribute to ambient marine noise in the sanctuary, whether through their own operation (engines, props, and electronics) or secondarily, through the activities that they are specifically there to perform (such as dredging). Some, like private and commercial whale watching vessels, specifically target cetaceans. Due to their routine approaches and close proximity, the potential acoustic impacts of such vessels may be a source of chronic exposure. Fishing vessels regularly overlap with cetaceans in the sanctuary and so their presence and activities may also be a source of acoustic disturbance. Cetaceans are also known to aggregate in and near the shipping channel and their long-term acoustic exposure to traffic may have a corresponding impact. Finally, there may be important sources of noise that have yet to be identified.

Evaluation of Existing Regulations Addressing This Issue

- NMFS guidelines

Literature Cited

Richardson, W.J., Greene, C.R., Malme, C.I. and Thomson, D.H. (1995). Marine Mammals and Noise. Academic Press, New York. 576 pp.

Anderson, A.L. and Gruber, G.J. (1971). Ambient noise measurements at 30, 90, and 150 kHz in five ports. J. Acous. Soc. Am. 36:2152.

Andrew, R.K., B.M. Howe, J.A. Mercer, and M.A. Dzieciuch. 2002. Ocean ambient sound: Comparing the 1960s with the 1990s for a receiver off the California coast. Acoustics Research Letters Online 3(2):65-70.
National Research Council (2003) Ocean noise and marine mammals: Committee on the impacts of ambient noise in the ocean on marine mammals report. Ocean Studies Board, Washington, D.C., 208 pp.

Yost, W.A. (1994) Fundamentals of Hearing: An Introduction. Third Edition. Academic Press, New York

Scheifele, P.M. (2000a). "Ambient Noise in the Stellwagen Bank National Marine Sanctuary." NOAA white paper for SBNMS

Scheifele, P.M. (2000ba). "Tutorial: Whale Hearing- Ear Anatomy, Physiology and Basic Audiology." NOAA white paper, SBNMS

Noise Disturbance Action Plan: Strategies and Implementation
work in partnership with various agencies and organizations involved with noise disturbance to implement the following strategies and activities. *Suggested personnel, inter-program relationships, suggested implementation and costs, enforcement considerations, suggested performance measures to assure effectiveness of management plan to be considered.*

Strategy ND-1: Acoustic Consortium
The Sanctuary will host a consortium for research on noise in and around the Sanctuary and its effects on marine life.

Recognizing the need for independent, targeted research and maintaining scientific integrity of those datasets members of the SBNMS Acoustic Consortium will agree to partner with the Sanctuary and make raw data available through the established data-use policy.

Strategy ND-2: Development of research recommendations

Activities:
1.1 Baseline sampling to establish and evaluate variation in the background noise levels from activities within or propagating into the sanctuary.

Placing and monitoring a hydrophone array and maintaining the resulting data set would address 2 critical needs:
1. A record of the noise budget in the long-term.
2. A neutral dataset for addressing potential impacts of noise on events such as strikes and strandings.

Several activities devoted to acoustic monitoring in and around the SBNMS are planned in the near future (i.e., summer and fall 2004). These could serve as pilot projects by which to exercise and evaluate the concepts of a consortium and access to acoustic data. (This was the piece developed by Chris Clark at the meeting)

Little data exist with which to evaluate variations in background noise levels and patterns of sound propagation in the SBNMS. Such information is critical to assessing the present and future risk of noise to marine life. One approach would be to focus this effort on areas of the sanctuary where whales are known to congregate. Acoustic monitoring could then be accomplished by a variety of mechanisms such as bottom-mounted arrays or "pop-up" buoys. Potential benefits include providing information on seasonal variations, spatial variations, and diurnal variations. These would serve as a valuable record for retrospective analyses. One desirable possible outcome would be the construction of a 3D noise propagation model for those sites within the sanctuary.

1.2 Collect data with which to evaluate the potential impact of specific noise sources, such as specific vessel types or activities. .

1.3 Identify entities conducting relevant acoustic research and initiate partnerships as appropriate. with.

1.4 Investigate a non-invasive tagging program to evaluate the potential for acoustic exposure and animal responses to acoustic stimuli. . Advances in suction cup tag technology, like the DTAG (WHOI), allow sound levels to be recorded at the whale and include both received sounds and those made by the whale. Furthermore, modern tagging technology allows for sensitive measurement of behavioral

and physiological responses (such as heart rate). Such data can greatly enhance understanding of animal detection and responses to specific stimuli. However, any tagging program within the Sanctuary program must take into consideration that the tagging process itself may be a source of behavioral disturbance for the individuals under investigation.

APPENDIX B: Fishing Issues Action Plan

Action Plan: SBNMS Marine Mammal Behavioral Disturbance

Goal Statement
The goal of this working group is to devise a framework to assess and minimize behavioral disturbance to marine mammals, and to foster cooperation with cross-jurisdictional partners which affect those living marine resources.

2.C.2 Issue Addressed: Fishing Issues

FISHING ISSUES ACTION PLAN

Introduction
Public scoping identified particular concern that fishing activities may result in the undue disturbance to marine mammals. Specific concerns from the public scoping process to be answered include:

1. Large midwater trawlers are competing with marine mammals for food and they fish in close proximity to marine mammals.

2. Tuna fishermen often target areas where marine life, including whales, is present. These fishermen often transit close to whales with little regard for them, and several observers have seen numerous close calls.

3. Fishing for herring should be outlawed.

SBNMS Position on Fishing Activities as a Potential Marine Mammal Behavioral Disturbance

The potential for competition between fisheries and marine mammals is an issue which extends outside the purview of the Sanctuary. This is an immensely complex and controversial topic which has generated much debate in the realms of both science and politics; among other things, it is currently the basis for many of the arguments over Ascientific@ whaling by Japan and Iceland. Addressing the question of whether fisheries exploitation impacts whales (by removing their food) or, conversely, whether consumption by whales of commercially valuable prey species negatively impacts fisheries, is extremely difficult. Scientific approaches to this issue involve complex ecosystem modeling whose input parameters and conceptual frameworks are both highly debatable, and there is unlikely to be any resolution of this problem in the foreseeable future. Thus, fishery-cetacean competition is a broad issue which clearly lies outside the realm of the Sanctuary (among other things because the ecosystem within the Sanctuary cannot be considered separate from the broader marine system of the Gulf of Maine and beyond).

Furthermore, there is currently no evidence that fishery takes within the Sanctuary are of sufficient magnitude to impact the prey base of the marine mammals found there, although it must be acknowledged that no research has been conducted on this topic. Sand lance (*Ammodytes* spp.) appear to be the primary prey of large whales in this region at the present time, and there is currently no fishery for this species here or elsewhere.

However, the group acknowledged that, should intensive fishery effort for small finfish (including sand lance, herring [*Clupea harengus*] and potentially other species) be proposed within the Sanctuary in the future, the Sanctuary should consider the question of whether the proposed catches would be of sufficient size to significantly deplete the marine mammal prey base in the area. Research to estimate the abundance of prey species, and to assess the potential energetic requirements of whales, would be required, as well as more challenging studies of the potential ecosystem impact of large catches of fish species. It was recommended that Sanctuary staff should immediately enquire with NMFS personnel regarding the likelihood that such intensive fishing effort would occur within the Sanctuary in the near future.

Currently there are no regulations on tuna spotter planes, but tuna fisherman have stated that they target whales and whale watch boats because of the possible presence of sand lance. The impact of tuna spotter planes on marine mammal disturbance will be discussed in the overflight action plan.

Many commercial fishing boats transit the bank to and from fishing grounds within, and beyond, the Sanctuary. Because they are readily able to maneuver, these vessels should be considered to be power driven vessels (per USCG Rule 3(b)*) and be subjected to the same regulations of other vessels in the vicinity of whales. Furthermore, tuna boats trolling lines through concentrations of whales are likely to disturb whales that may be feeding or nursing, and instances have been reported of tuna hooks becoming embedded in whales. Although these issues are not likely to represent a major problem for whales (and would be considered low priority relative to more pressing issues such as entanglement and vessel collisions), and there is a risk of disturbance or collision if recreational and/or commercial fishing vessels transit through concentrations of whales in pursuit of fish.

*In the International Navigation Rules, according to CG Rule 3 (d), the word "vessel engaged in fishing" means "any vessel fishing with nets, lines, trawls, or other fishing apparatus which restricts maneuverability, but does not include a vessel fishing with trolling lines or other fishing apparatus which do not restrict maneuverability". Therefore, vessels that are underway and are not restricted in their maneuverability are power driven vessels and must abide by all rules applicable to power driven vessels.

Activity

Strategy FI-1: Outreach and Education
The Working Group SBNMS should include recreational and commercial fishing vessels in the development of education materials regarding precautionary operation of vessels around whales

APPENDIX C: Whale Watch Action Plan

Action Plan: SBNMS Marine Mammal Behavioral Disturbance

Goal Statement
The goal of this working group is to devise a framework to assess and minimize behavioral disturbance to marine mammals, and to foster cooperation with cross-jurisdictional partners which affect those living marine resources.

2.C.1 Issue Addressed: Whale Watch Activity

WHALE WATCH APPROACH ACTION PLAN

Introduction

Public scoping identified particular concern that whale watch activities may result in undue disturbance to marine mammals. Specific concerns from the public scoping process to be answered include: Have we answered all the public scoping concerns?

1. Are whale watch approach guidelines (which includes commercial, whale watch, and recreational vessels) sufficient to protect marine mammals from harassment or are regulations necessary?
2. Should whale watch approach guidelines / regulations for private recreational boaters to reduce risk of harassment be different?
3. Should personal watercraft (such as "jet skis" and kayaks) be allowed in the Sanctuary?
4. What level of behavioral disturbance is currently known to exist?
5. Could a whale watch certification program assist in decreasing behavioral disturbance?
6. Do cumulative whale watch activities increase noise pollution and amplify approach issues to unacceptable levels?
7. What research could inform decision-making and management?
8. How are other agencies or groups addressing the issues in a regional context and under what authority?
9. How can enforcement measures be ensured?

History of Whale Watching on SBNMS

For more than 25 years, Stellwagen Bank has been the primary destination for whale watchers departing from Massachusetts; the area is consistently rated as one of the top ten places for whale watching in the world. As a result of its significance to whales, Stellwagen Bank was designated as a National Marine Sanctuary in 1992. While commercial whale watching in Stellwagen Bank began with only one company departing from Provincetown, MA in 1975, there are currently more than 20 companies operating more than 30 boats departing from April through November.

The benefits derived from commercial whale watching are both scientific and economic. A 2000 literature review found 62 scientific papers were generated from studies performed opportunistically aboard commercial whale watching vessels (Robbins 2000). The economic significance is also substantial. In Massachusetts alone, whale watching employs approximately 750 people in 9 communities, generating more than $24 million a year in ticket sales (Hoyt 2001). These numbers, resulting from the sale of whale watch tickets, do not take into account the various service industries that benefit from the huge influx of tourists such as hotels, restaurants, local vendors and transportation providers.

However, as whale watching grows in popularity around the world there is increasing concern regarding the short-and long-term impacts on the targeted whale populations. Impact studies have shown: changes in ventilation rate (Baker 1988); avoidance behavior (Donovan 1986); changes in habitat use (Corkeron 1995); and abandonment of key habitat (Whitehead and Moore 1982--does not have to do with abandonment need alternate cite [Glockner-Ferrari and Ferrari 1990]). <<I can probably beef up this list of studies. Also, I would like to come up with some additional text here to the effect that, for whatever reason, different impact studies have not necessarily documented the same effects (for example ventilation rates increasing in one study and decreasing in another) >> The concerns may be further compounded by the increase in popularity of whale watching, not just commercially, but also recreationally.

In an attempt to minimize the impacts of commercial whale watching, the NMFS first established regional guidelines in the Northeast in 1985. These guidelines remained in effect until 1999 when, as a result of two potentially fatal collisions of whales from commercial whale watching vessels in 1998, the United States National Marine Fisheries Service (NMFS), Northeast Region, convened a Whale Watch Advisory Group (WWAG) to discuss the impact of whale watching on whales within the Gulf of Maine and to review the effectiveness of current guidelines. The WWAG was comprised of commercial enterprises, conservation and animal welfare groups, and the NMFS. Recommendations included reduced speeds when in sight of whales, and limits on the number of vessels within 183m (600 feet) of whales. A preliminary study conducted on the speed portion of the guidelines by the SBNMS indicated that compliance with guidelines by commercial whale watch vessels was low (David Wiley, personal communication). However this study did not address whether the guidelines were effective in minimizing behavioral disturbance.

Although outreach to the whale watching industry was a priority, little effort was made to educate private boaters. As a result, the International Wildlife Coalition and the Stellwagen Bank National Marine Sanctuary have collaborated on an innovative new public education campaign entitled "See A Spout, Watch Out! Responsible Whale Watching" (Appendix II). Additionally, the International Fund for Animal Welfare worked with the state of Massachusetts, the Center for Coastal Studies and the NMFS to distribute educational material to registered boaters throughout Massachusetts. (Steer Clear ..)

While the Sanctuary has a history of outreach to recreational boaters regarding whale watch guidelines, little information is known regarding the numbers of recreational boats that whale watch and the impacts on the targeted animals. As such, it is important to balance economic needs with conservation and the following recommendations are offered.

Evaluation of Existing Regulations

- NMFS Whale Watch Guidelines—Northeast Region (See Appendix III)

Whale Watch Action Plan: Strategies and Implementation
The Sanctuary will work in partnership with various agencies and organizations involved with whale watch vessels to implement the following strategies and activities. *Suggested personnel, inter-program relationships, suggested implementation and costs, enforcement considerations, suggested performance measures to assure effectiveness of management plan to be considered.*

Strategy WW-1: Development of regulations governing the operation of vessels in the vicinity of whales, porpoises, and dolphins.

Based on past incidents in which whale watch vessels and private boaters have struck whales, and on complaints that the behavior of vessels appeared to disrupt patterns of normal behavior (e.g., separating mothers from dependent calves, preventing whales from surfacing in "bubble clouds" made during foraging bouts, etc.), the NOAA Fisheries Service issued guidelines for whale watching. It is considering codifying guidelines into regulations. Because animals within the SBNMS are the focus of both commercial and recreational whale watching, the working group discussed the need to implement regulations independent of the NOAA fisheries process because the Sanctuary was created, in large part, to safeguard its historic importance as a feeding area for endangered whales.

Activities:

1.1.A SBNMS should draft regulations based on the currently existing NMFS (NE region: 100 feet) guidelines applicable to all vessels in the vicinity of whales (with existing exceptions applicable for commercial fishing vessels engaged in fishing (ref. CG Rule 3 (d)) or authorized vessels investigating entanglements). Unlike guidelines, regulations are legally enforceable. Regulations should be reviewed and modified as necessary based on the results of proposed research (see WW-4).

Rationale:
While members of the working group agreed that regulations should be based on scientific research there was concern expressed regarding the inability to enforce current guidelines. Therefore, members of the working group recommend codifying the current guidelines until research is completed.

Use the Coast Guard definition of vessel to assure inclusion of personal water craft and kayaks. [CG Rule 3 (a) states: the word "vessel" includes every description of water craft, including non-displacement craft and seaplanes, used or capable of being used as a means of transportation on water."

Use the Coast Guard definition of a "vessel engaged in fishing" to ensure that only vessels restricted in their maneuverability are exempted. [CG Rule 3 (d) states: the word "vessel engaged in fishing" means any vessel fishing with nets, lines, trawls, or other fishing apparatus which restricts maneuverability, but does not include a vessel fishing with trolling lines or other fishing apparatus which do not restrict maneuverability.

1.1.B **The Sanctuary should not codify the existing NMFS guidelines.**
Rationale:
The question of whether the existing whale watch guidelines are effective in minimizing behavioral disturbance has not yet been answered and in fact cannot be determined until the appropriate research is done. Therefore, members of the working group recommend that a comprehensive research plan be created and implemented for the purpose of reviewing the effectiveness of the whale watch guidelines that can then be amended or codified subsequent to relevant findings.

Regulations should be based on scientific research. A dire need to place regulations before research has not been demonstrated and it is believed that to do so would render any premature regulation vulnerable to legal scrutiny. Additionally, an effective enforcement component has not been present in the past and therefore the existing guidelines cannot be judged on the criteria of not having been enforced. An effective enforcement component is imperative to ensure the long term success of either guidelines or regulations.

1.2 Prohibit the use of motorized Personal Water Craft (PWC) in SBNMS.

Personal Water Craft (PWC). Because of the distance from shore, PWC use in the Sanctuary has not been a concern to date; however there is a concern regarding these craft based on good evidence that such craft have caused abandonment of habitat by humpback whales in Hawaii (Glockner-Ferrari and Ferrari, 1990). PWC craft (such as jet skis), therefore, pose a risk of disrupting whale behavior. The SBNMS should prohibit their use in the Sanctuary both as a matter of human safety and to prevent disruption to or injury of whales. WG will define PWC.

1.3 Review the use and effects of kayaks in SBNMS, in the vicinity of whales, for human safety considerations and their potential effects on marine mammal behavior.

Operations already exist that offer to transport kayakers to Stellwagen Bank to watch whales. Because of the extremely limited visibility from such a low platform and the limited maneuverability of kayaks in the hands of amateurs, a personal safety issue exists for kayakers in the vicinity of whales. The SBNMS may wish to consider restricting or prohibiting the use of kayaks within its boundaries as an issue of personal safety.

1.4 Investigate feasibility of a two-tiered regulatory program, such that certified vessel operators would be permitted to approach whales as stated under the current SBNMS regulations (100 feet) but noncertified vessel operators would be required to comply with NMFS recreational boater guidelines (300 feet) See Appendix.

OPTION A:
As an alternative proposal to the one outlined in 1.1 above, the Sanctuary would implement a two-tiered regulatory program to regulate the distance of approach to whales. Under this type of system, all boat operators (commercial and recreational) would be able to attend a short "safe whale watching" course that would review the regulations, provide information on whale species and common behaviors, and instruct them on safe boating around whales and the consequences of heedless conduct. Once they had attended, they would be allowed closer access (100 feet) to whales than boaters who did not possess a certificate (300 feet).

This effort would ensure that only those operators who were familiarized with whale behavior and risk averse vessel operation could get close to whales (100 feet). Under the current systems of guidelines, ANY boater is allowed to approach within 100 feet. This means that ill-informed boaters may inadvertently enter bubble clouds of feeding whales or make risky approaches that would be prevented if they were forced to remain 300 feet away from whales, as would be the case if they lacked a certification in a two-tiered regulatory system.

OPTION B:
Because Stellwagen Bank Sanctuary has over 840 square miles in it, it a very difficult and expensive area to police. The certifying of boat operators would be very time consuming and expensive. Many programs in this country are pushing for education rather than regulations.

Observations over the past 30 plus years of fishing and watching the whales shows that education is the best and most practicable way of protecting the whales. We have a great untapped resource that should be used. Whale protection can be taught in schools, Youth groups can assist with outreach programs such as Boy Scouts, Girl Scouts; many high schools students have community service programs that can assist. Other methods to increase visibility include placing signs at marinas, launching ramps and boat clubs. The Coast Guard Auxiliary and other boating courses can use handouts.

Strategy WW-2: Enforcement

The working group believes that an increased presence on the water is needed to monitor compliance with guidelines and/or to enforce potential future regulations, particularly during high use periods.

Activities:

2.1 Mandate regular Sanctuary presence on the Bank

It is recommended that a Sanctuary vessel be secured for permanent duty to provide a regular presence within the Sanctuary. This should be for a specified number of days per year, i.e., a minimum time coverage, or that teamwork with other state and federal agencies be instituted to achieve the desired coverage. There are many reasons for the presence of a Sanctuary vessel, including enforcement, research, marine mammal disentanglement and stand-by, and education and outreach.

2.2 Develop a menchanism to notify vessels when in non-compliance of whale watch guidelines or have violated potential regulations.

Strategy WW-3: Outreach/Education
Efforts to regulate vessel conduct around whales, and the ancillary need of enforcement require an aggressive community outreach program to make boaters aware of regulations, rationale and penalties for

Activities:

3.1 Provide a Sanctuary accreditation program for commercial whale watch operations to promote responsible whale watching.

Rationale:
The SBNMS should offer a semi-annual, voluntary accreditation course to captains of whale watching companies that would review the regulations, provide information on whale species and common behaviors, and allow an opportunity to share information regarding safe boating around whales and the consequences of heedless conduct. Attendance at this course would result in issuance of a certificate that could be advertised by the whale watching company. Additionally, companies with captains who had completed the course could be "starred" in the SBNMS listing of all whale watching companies. The intent is to provide incentive for potential customers to choose a whale watching company whose captains had demonstrated a greater interest in risk averse whale watching.

**This program could be a template as an incentive program for all boaters*

3.2 Assess current boater outreach programs with continued support for effective programs where appropriate. Develop supplemental materials as needed. Sanctuary should actively seek funding partnerships.

Rationale:
Due to the aggregation of wildlife within the Sanctuary there are increased interactions between whales and boats. As a result, the risk of harassment and vessel collisions with whales increases.

The concerns raised by large numbers of well-meaning but uneducated boaters operating closely around large whales underscore the need to increase awareness of vessel operators of how to safely maneuver in the presence of whales. Programs to educate recreational boaters within the Sanctuary have been conducted. **In ____(year)** the International Fund for Animal Welfare, working with the NMFS, MA State Dept., and the Center for Coastal Studies, developed “Steer Clear,” a brochure sent

to boaters registered in Massachusetts. Additionally, The International Wildlife Coalition, in conjunction with the Sanctuary developed a multi-phase, multi-year program called "See A Spout, Watch Out! Responsible Whale Watching" in an attempt to increase awareness to recreational boaters about whale watching guidelines within the Sanctuary.

3.3 Convene a biennial or annual conference prior to the whale watch season (March to April) for educators, naturalists, and citizens at large to learn about SBNMS resources, research, conservation, and regulations. Provide PDPs (Professional Development Points) and education materials to be used in classrooms, whale watch vessels, and in continuing education units.

Strategy WW-4: Research

Research will enhance our understanding of the use of the Sanctuary by both vessels and whales in order to inform future protective efforts. Additionally, information on short- and long-term impacts of vessels and associated noise on whales is needed. (See Noise Action Plan).

Activities:

4.1 Keep track of how many whale watch vessels (recreational and commercial) are using the Sanctuary to track trends in commercial whale watch activity over time. Additionally, continue trackline survey studies to monitor distribution of whales and vessels in the sanctuary spatially and temporally.

4.2 Encourage species recognition and individual ID studies which provide an opportunity to determine long term impacts.

Rationale:
The ability to identify individual animals is an important aspect of wildlife studies. Individual identification can give researchers information regarding population size, life span, social structure, reproductive capabilities, migratory patterns and behavioral ecology. Studies of individuals can also help determine if there are differences in the behaviors or habitat utilization between animals. For example, ID studies may provide data with which to determine whether whales that frequent the Sanctuary are more habituated to boat traffic than those that tend to use other Gulf of Maine areas.

There is a long history of individual identification of large whales that visit the greater Sanctuary area, first beginning in the late 1970s and continuing through today. For the past several years the Sanctuary has helped to sponsor the annual Humpback Whale Naming Workshop that catalogues newly sighted whales that are primarily photographed within the Sanctuary.

4.3 Encourage partner institutions to strongly consider how existing data and shared scientific interests might be applied to the understanding of whalewatch impact <<by this I mean that we all have ideas for studies that we never get around to get around to, but might if we had extra reason to prioritize it>>

4.4a Investigate research strategies to determine short term and cumulative impacts of human activities on whales including but not limited to assessing harassment and disruption of marine mammals and to better define approach regulations.

Rationale:
Guidelines governing vessel approaches to whales (specifically for the purpose of commercial or private whale watching) have been in place in New England and elsewhere for many years. These guidelines have been designed to prevent collisions with whales, and also to minimize the potential

for behavioral disruption and harassment. However, neither these guidelines (nor regulations in place elsewhere, e.g. in Hawaii) have been based upon the results of directed, controlled studies.

While there are good precautionary reasons for the Sanctuary to codify existing NMFS guidelines into regulations within the Sanctuary, the group recognized that regulations would be far more defensible if they were based upon research specifically directed at this issue. Accordingly, the group recommended that such studies be conducted in the near future, and that the results of those studies be used to modify Sanctuary (and potentially NMFS) policy regarding whale-watching regulations. (See Exhibit A for a detailed list of potential research study elements).

4.4b Investigate non-invasive tagging programs.

Rationale:
Photo-ID produces valuable but sporadic data on the behavior of individuals, such as their distribution and habitat use patterns. By contrast, tagging has the potential to provide a more continuous record of behavior. This can be useful when interested in determining the amount of time spent in an area or when studying short term responses to stimuli. Advances in this regard include the potential for data collection on body position/attitude, surfacing and ventilation patterns and physiological responses.

However, any tagging program within the Sanctuary must strongly consider the potential impact of tagging itself, including the tagging process. Furthermore, this may not be the most effective method of determining cumulative impacts in a population with over two decades of prior exposure.

Strategy WW-5: Emerging Issues—this must have become Appendix C, yes?
The WG identified a number of issues that may need to be addressed in the future, either because there is a potential increase in current activity in the Sanctuary or because activity does not currently occur, but may be proposed for the future.

- **Dive boats.** As has happened in marine sanctuaries elsewhere, there is the potential for entrepreneurs to offer diving trips to Stellwagen Bank, either for viewing of archaeological sites or marine life. Should this type of operation be proposed, the SBNMS should be aware that it poses a risk of behavioral disruption of animals, and that regulation may be necessary.

- **High speed ferries.** With advancing technology, passenger ferries between Boston, the Massachusetts north shore, and Cape Cod have become faster and more numerous. This increased speed may pose a higher risk of collision or behavioral disruption because both operators and whales have reduced reaction time. We assume that collision risk is being addressed by other working groups, but if not, we recommend that the SBNMS coordinate with NOAA Fisheries to document this use and consider regulation.

- Military vessels. Military vessels regularly traverse the Sanctuary and, with concerns about homeland security, traffic may increase. This traffic presents a similar risk of collision or disruption of behavior as any large vessel. We assume that collision risk is being addressed by other working groups, but if not, we recommend that the SBNMS coordinate with NOAA Fisheries to document use of the Sanctuary and consult with the Department of Defense if necessary.

- **Parasailing.** As has happened in marine sanctuaries elsewhere, there is the potential for entrepreneurs to offer parasailing trips on Stellwagen Bank. Because tow boats are limited in their maneuverability

as they tow an aerial passenger, they may pose a risk of collision or disruption to nearby whales. Should this type of operation be proposed, the SBNMS should be aware that it poses a risk of behavioral disruption of animals, and that regulation may be necessary.

- **Whale watching planes.** In a number of national parks, aerial viewing of natural wonders has increased. Should such operations be proposed for SBNMS, operators would need careful scrutiny to assure that whales are not harassed. We note recommendations elsewhere in this report relative to recommended altitudes to avoid harassment.

EXHIBIT A: VESSEL APPROACH STUDIES

Studies to assess the effect on whales of directed vessel approaches would potentially include the following elements:

- A control period during which whales are observed undisturbed by any vessel; this could be conducted either from a station on shore (in a location where whales are sufficiently close to land) or from a vessel that is dead in the water.
- Following the control period, directed approaches could be conducted by one or more vessels at a variety of speeds and distances.
- Response of whales to specific acoustic stimuli (such as vessel noise) could also be assessed via playback studies.
- Following an appropriate control period, opportunistic observations could also be made of responses of whales to actual approaches by whale-watching or private vessels, although a reliable method of distance estimation would have to be included in this protocol.
- Whales could be tagged with suction-cup digital tags that record sound and monitor the exact movements of the tagged animal in space. This technique has been used successfully with right whales in conjunction with playback experiments to assess the whales' reactions to vessel approaches, alarm signals and other stimuli (Nowacek *et al.* 2002, 2003), and would be very useful here.
- Variables to be measured during the control and exposure periods would include (but not necessarily be limited to): respiration rate, dive time, movement and behavior.
- The study would need to target enough animals (of both sexes and all age classes) and conduct enough trials on each animal to provide a statistically robust sample that allowed for significance to be assessed (i.e. beyond normal variation).
- Significant changes in any of the measured variables in response to controlled approaches or playbacks, or to actual approaches by other vessels, would potentially be considered as disruptive. However, interpretation of such data, and determination of the biological significance of impacts, would require further discussion within the scientific community.
- It is essential that any study of this nature be submitted for publication in a peer-reviewed journal, and also be reviewed by other scientists prior to acceptance as a basis for establishing any regulations.

APPENDIX I: Literature Cited

Baker, S.1988. Behavioral response of humpback whales to vessels in Glacier Bay., p.16 in Proceedings of the Workshop to Review and Evaluate Whale Watching Programs and Management Needs., 14 –16 Nov. 1988, Monterey, Calif., Center for Marine Conservation, Washington, D.C.

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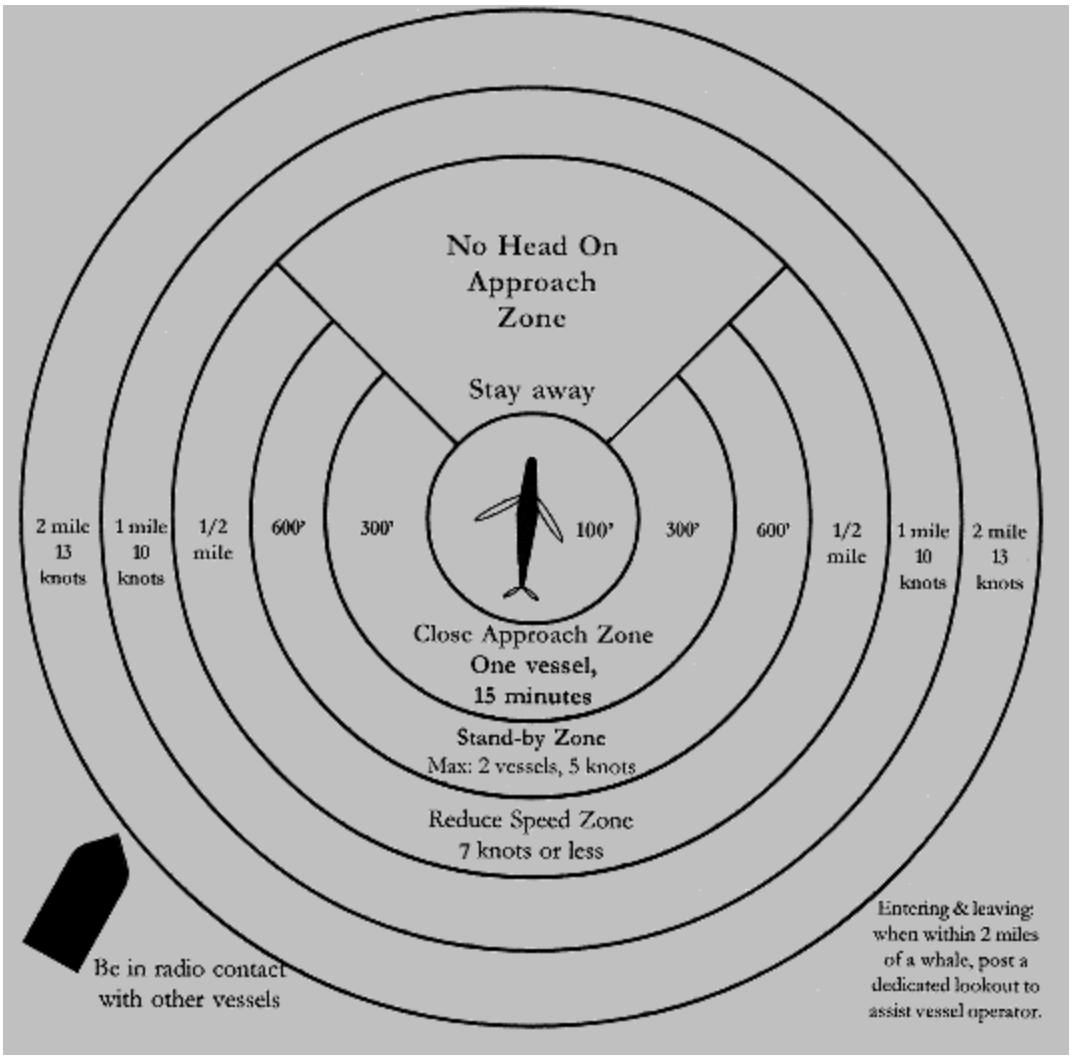
Whitehead, H., and Moore, M.J. 1982. Distribution and movements of West Indian humpback in winter. Canadian Journal of Zoology. 60 (9) 2203-2211.
Appendix II: "Sea A Spout, Watch Out!"

APPENDIX II: "See A Spout, Watch Out!"

APPENDIX III: NMFS Whale Watch Guidelines—North East Region



APPENDIX IV: Personal Water Craft Guidelines

National Guidelines or Regulations

New Jersey: Wildwood Crest (New Jersey, USA) Environmental Commission enacted a "dolphin-safe zone" extending 200 feet from the water's edge, where gillnet fishing and boat/personal watercraft speeding is prohibited when dolphins are present.

Gulf of Farallones NMS: NOAA amends the regulations governing activities in the Gulf of the Farallones National Marine Sanctuary (GFNMS or Sanctuary) to prohibit the operation of motorized personal watercraft (MPWC) within the boundaries of the GFNMS. This regulation is necessary to protect sensitive biological resources, to minimize user conflict, and to protect the ecological, aesthetic, and recreational qualities of the Sanctuary. NOAA also announces the availability of an Environmental Assessment (EA) on the rule. Dates: Effective October 10, 2001. This study used a PWC to determine dolphin avoidance to boat traffic: Nowacek, S. M, R. S. Wells and A. R. Solow. 2001. Short-term effects of boat traffic on bottlenose dolphins, Tursiops truncatus, in Sarasota Bay, Florida. MMS:17(4):673-688. I don't know the original source of this quote: In particular, NOAA concluded that "marine mammals are more disturbed by [personal watercraft], which run faster, on varying courses, or often change direction and speed, than they are by boats…."

Hawaii NMS: PWC are banned in conservation districts and marine natural areas. They are not allowed from December 15-May 15 on the west and south sides of Maui to protect humpback whales.

Monterey Bay NMS: Motorized personal water craft means any motorized vessel that is less than fifteen feet in length as manufactured, is capable of exceeding a speed of fifteen knots, and has the capacity to carry not more than the operator and one other person while in operation. The term includes, but is not limited to, jet skis, wet bikes, surf jets, miniature speed boats, air boats, and hovercraft. MBNMS: Prohibits the Operation of motorized personal watercraft within the Sanctuary except:

Within the four designated zones and access routes within the Sanctuary.

INTERNATIONAL

Australia: Guidelines
Whale and dolphin watching from personal, motorized craft (e.g. jet skis and similar craft) and hovercraft is prohibited. Strict regulations govern approaches to whales and the law provides heavy penalties for disturbing or harassing them.

Australia: Jet Skis must never approach closer than 300m. When leaving whales, move off slowly at 'no wake' speed until at least 300 metres away (400 metres for jetskis).

Powered and unpowered vessels (including surfboards)

- Must never approach closer than 100metres. Jetskis (PWCs) must never approach closer than 300 metres
- If a whale is accompanied by calf do not approach closer than 200 metres
- Within 300 metres of a while' (400 metres for jetskis) move at a constant speed no faster than the slowest whale or at idle 'no wake' speed
- Approach from a direction parallel to the direction of movement of the whales and slightly to their rear
- Avoid sudden or repeated changes in speed or direction

- When stopping to watch whales either place your engines in neutral or allow the motor to idle for one minute before switching off
- No more than three vessels should attempt to watch a whale or whales at one time
- Do not 'box' whales in, cutoff their path, or prevent them from leaving

When leaving whales, move off slowly at 'no wake' speed until at least 300 metres away (400 metres for jetskis).

Azores: Regulation
No jet skis, sub-aquatic scooters, kayaks, boards and similar platforms

Mexico: Regulations for Humpback whales
Water skis, para-sails, gliders and helicopters are not permitted for whale watching.
Jet skis, kayaks, canoes and inflatable rafts with oars are not permitted for whale watching.

Puerto Rico: Regulations
It is prohibited to observe whales from jet skis.

Tonga: Guidelines
Human-powered paddle craft must not approach within 75 metres of a Whale.
The use of jet skis is banned for Whale Watching. If a jet ski is in the vicinity of Whales, a distance of 2,000 metres is required.

APPENDIX D: Overflight Action Plan

Action Plan: SBNMS Marine Mammal Behavioral Disturbance

Goal Statement
The goal of this working group is to devise a framework to assess and minimize behavioral disturbance to marine mammals, and to foster cooperation with cross-jurisdictional partners which affect those living marine resources.

2.C.3 Issue Addressed: Overflight Harassment

SBNMS OVERFLIGHT ACTION PLAN

Introduction

Public scoping identified particular concern that SBNMS's lack of overflight restrictions may result in undue disturbance to marine mammals. Currently, SBNMS has no overflight restrictions and no studies on aircraft disturbance have been conducted in the SBNMS region. Specific concerns from public scoping process to be answered include:

1. Does overflight by aircraft disturb marine mammals while resting, feeding or during social interactions? (e.g. tuna spotter planes)

2. Should there be restrictions on low flying aircraft?

3. How are NOAA Sanctuaries and other agencies addressing the issues in a regional context and under what authority?

Overflight Research

Research (Richardson *et al.* 1995; Patenaude *et al.* 2002) demonstrates that the level and frequency of aircraft sounds propagating in water are strongly affected by water depth and bottom conditions. Lateral propagation is better in shallow water than in deep water. Many reflected paths are possible in shallow water. As a result, the time during which an airborne source passing overhead can be received underwater is lengthened in shallow water by multiple reflections.

The angle at which a line from the aircraft to the receiver intersects the water's surface is important. At angle >13 degrees from the vertical, much of the incident sound is reflected and does not penetrate into the water (Richardson *et al.* is this 1995 also?). This is especially true with calm seas, deep water, or shallow water with a nonreflective bottom. The lateral distance at which aircraft noise becomes undetectable varies with local ambient noise conditions, water depth and bottom reflectivity, but is generally brief in duration, especially when compared with the duration of audibility in air.

The auditory systems of baleen whales are assumed to be sensitive to low-frequency underwater sounds, based on the predominantly low frequency of their calls, their auditory anatomy, and their observed reactions to various low frequency sounds (Ketten 2000). In contrast, dolphins have insensitive underwater hearing below 1 kHz but acute hearing at frequencies > 10 kHz. For either, aircraft flying

directly overhead at altitude 160 m, they received levels of low-frequency tones 18 m below the surface which were well below auditory thresholds and corresponding frequencies, and presumably inaudible.

Helicopter Disturbance
Patenaude *et al.* (2002) (e.g., studies on bowheads and belugas in Alaska) show that the level of sound from any type of aircraft depends on receiver depth and the altitude, aspect, and strength of the noise source. Observation showed that single straight-line helicopter overflights can briefly affect the behavior of some bowhead whales at altitudes < 150 meters, although these may not be biologically significant. It is more likely that circling or prolonged hovering at low altitude would more likely cause important disturbance effects.

Fixed-Wing Aircraft Disturbance
Reactions to turbine-powered fixed-wing aircraft (Twin Otter) were less pronounced than those to a helicopter, possibly because of the weaker and less complex sound. The most common reaction was an unusually short surfacing, but there were also instances of abrupt dives and of turning or heading away. Reaction frequency diminished with increasing lateral distance and with increasing altitude. (Patenaude *et al.* 2002)

When dealing with aircraft sound, an altitude of 300 meters is the usual reference distance for in-air measurements and predictions, and the same convention is appropriate for underwater sound from aircraft. It is impossible to isolate the concepts of source level and propagation loss when considering underwater noise from aircraft.

Airship Disturbance
Fill in (re: shadowing (Pers Comm. Carlson 2003)

Shadowing citation: In MMS 17(4):673-688: "Nowacek et al (2001) found that dolphins sometimes exhibit brief (<10s) avoidance behavior towards the airship's shadow; however, these occurrences are infrequent and responses are not consistent."

Summary of Possible Concerns
Fill in

Literature Cited: (Appendix I)

Evaluation of Existing Regulations Addressing Overflight in Vicinity of Whales

- SBNMS Regulations
  None to date.

- Federal Aviation Administration (FAA) Regulations (Appendix II)
  The existing regulations are the Federal Aviation Administration's (FAA) general operating and flight rules (Title 14, Part 91, Sec. 91.119 c) stating:

  (c) "over other than congested areas. An altitude of 500 feet above the surface, except over open water or sparsely populated areas. In these cases, the aircraft may not be operated closer than 500 feet to any person, vehicle, or structure.

(d) Helicopters. Helicopters may be operated at less than the minimums prescribed in … (*fill in*)

- National Marine Sanctuary Program (Appendix III)
  There are overflight regulations in the following national marine sanctuaries: Gulf of the Farallones NMS, Monterey Bay NMS, Hawaiian Islands Humpback Whale Sanctuary, and Olympic Coast NMS. (See attachment).

- NMFS North Atlantic Right Whale Overflight Guidelines (Appendix IV)

- NOAA Research Aerial Survey Guidelines (Appendix V)

- National and International Guidelines and Regulations as Applies to Whale and Dolphin Watching (Appendix VI)

- NE Regional Guidelines (fill in)

SBNMS Overflight Strategies and Implementation
The Sanctuary will work in partnership with various agencies and organizations involved with overflight craft to implement the following strategies and activities. *Suggested personnel, inter-program relationships, suggested implementation and costs, enforcement considerations, suggested performance measures to assure effectiveness of management plan to be considered.*

Strategy OV-1 Develop Outreach Advisories
There are currently no site-specific overflight regulations in SBNMS. Currently published NMFS NE regional guidelines on overflight approach to marine mammals are not FAA mandates and are not reflected in FAA publications. The behavioral disturbance working group recognized the need to minimize the potential disturbance from overflight activity, as well as inform the aviation community regarding overflight in proximity to whales.

Activities:

1.1 Work with pilot associations to include SBNMS notation and current NMFS NE Region overflight guidelines on aeronautical charts and information materials.

1.2 Develop a cross-jurisdictional monitoring program for overflight activities.

Strategy OV-2: Develop Overflight Schema

Activities:

2.1a. Create Sanctuary regulations, to govern the operation of airplanes, helicopters, airships, and other aircraft in the presence of marine mammals to state:

"Helicopters, airships, and other aircraft should not be operated lower than an altitude of 1000 feet, except where more restrictive regulations apply and for other approved activities in SBNMS, or where scientific research permits are granted by NMFS."

Rationale:
Based on research regarding potential disturbance of marine mammals by overflight activity, and the existence of overflight regulations in other sanctuaries, the behavioral disturbance working group felt the need to address this issue within the SBNMS regarding overflight activity.

2.1b. Do not create Sanctuary regulations to govern the operation of airplanes, helicopters, airships, and other aircraft in the presence of marine mammals

Rationale:
While the need of overflight guidelines is acknowledged, with respect to regulations, it is believed that more research is required in order to determine a minimum recommended altitude that would minimize or eliminate behavioral disturbance.

2.2 SBNMS should recommend that NOS ask NMFS to approach the FAA to change FAA regulations. 91.119 (c) to delete the word "or" following the word vehicle and insert "and marine mammals, except where more restrictive regulations prevail."

Strategy OV-3: Identify Information Gaps
The behavioral disturbance group recognized the need to gather additional data on overflight activities to understand the potential disturbance of marine mammals.

Activities:

3.1 Produce descriptive database to determine overflight use including planes, helicopters, blimps and other aircraft.

3.2 Recommend and support research to evaluate the impacts of noise, visual, and tactile stimuli.

3.3 Request NMFS (NE region) to look at inaccuracy of its characterization of FAA regulations in its whale watch guidelines.

Strategy OV-4: Emerging Issues
The behavioral disturbance working group identified a number of issues that may need to be addressed in the future, either because there is a potential increase in current activity in the Sanctuary or because activity does not currently occur, but may be proposed for the future.

- DOD Activities: Military planes fly over the Sanctuary, and with concerns about homeland security, traffic may increase. Due to the recent amendment to the definition of harassment under the MMPA (Section 3), some military activities which might previously have been considered to be harassment may now be exempted. Therefore, we recommend that the SBNMS coordinate with NOAA to document military use of the Sanctuary and consult with the Department of Defense if necessary. See Exhibit: A National Defense Authorization Act.

- Commercial Aerial Whale Watching: In a number of national parks, aerial viewing of natural wonders has increased. Limited aerial whale watching is already offered in SBNMS. Should expanded operations be proposed for SBNMS, operators would need careful scrutiny to assure that whales are not harassed. We note recommendations elsewhere in this action plan relative to recommended altitudes to avoid harassment.

- Tuna Spotter Planes: Tuna spotter planes sometimes target concentrations of humpback whales (because of their association with tuna, which presumably feed upon similar prey). However whales do not appear to be disturbed by these activities (Phil Clapham, personal communication). Typically, tuna spotters do not target specific individual whales and do not engage in the low-altitude, prolonged circling over whales that has been identified as a possible source of disturbance (i.e., from small planes engaged in whale-watching). Accordingly, it is our recommendation that tuna spotters be exempt from overflight restrictions.

- Shadow Effects of Overflight: Anecdotal evidence suggests that whales are startled, and their behavior disrupted, by shadows of aircraft passing over them. Low altitude use of tuna spotter planes, private aircraft and airships may cast shadows that disturb animals. We note recommendations elsewhere in this report relative to recommended altitudes to minimize this effect. The working group suggests that the Sanctuary conduct research to study the shadow effects of overflight.

EXHIBIT A:

National Defense Authorization Act
Section 319: Military Readiness and Marine Mammal Protection
"We put the sailor ahead of the sea lion."
- Rep. Duncan Hunter (R-CA)

The FY 2004 Defense Authorization Act (H.R. 1588) includes language that amends the definition of "harassment" under the Marine Mammal Protection Act (MMPA) to provide the military with greater leeway to conduct activities that might affect marine mammals, such as the use of submarine tracking sonar. The definition was amended largely in response to the Pentagon's claim that restrictions intended to protect marine mammals under the MMPA were unduly compromising national security by interfering with military readiness activities. Under the new definition, which was signed into law by President Bush on November 24, 2003, for "military readiness activities or a scientific research activity conducted by or on behalf of the Federal government," the term "harassment" means an action that injures or has the *significant potential* to injure a marine mammal or marine mammal stock in the wild; ordisturbs or is *likely* to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where such behavioral patterns are abandoned or significantly altered. [emphasis added]

This language differs from the MMPA's existing definition of harassment, which applies a higher standard to non-military and non-government research activities by requiring a permit if the proposed activities have the "potential to injure" or "potential to disturb." In other words, under the new definition, it may be easier for military and scientific research activities conducted on behalf of the federal government to proceed without authorization from NOAA Fisheries. From a conservation standpoint, the threshold for actions that require a permit is now lowered to those that have the "*significant potential* to injure" or are "*likely* to disturb."

The bill also changes the section of the MMPA dealing with exceptions and would allow "incidental takes" of marine mammals in "military readiness activities" during a five-year period as long as it will have a "negligible impact upon such species." Under the MMPA, the term "take" means to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal. This exemption would be similar to one given to the commercial fishing industry.

Further, the bill adds a national security exemption to the MMPA, which allows DOD to get a two-year exemption from compliance with the Act for any action or category of actions if the Secretary of Defense determines "that it is necessary for national defense.

APPENDICES

APPENDIX I: Literature Cited

APPENDIX II: *Federal Aviation Administration (FAA) Regulations*

APPENDIX III: *National Marine Sanctuary Program*

APPENDIX IV: *NMFS North Atlantic Right Whale Guidelines*

APPENDIX V: *NOAA Research Aerial Survey Guidelines*

APPENDIX VI: A Summary of National and International Guidelines and Regulations for Aircraft for Watching Whales and Dolphins (submitted by Carole Carlson, International Fund for Animal Welfare)

APPENDIX VII: *References and Consultants* (Identification of resources informing decision-making process of MMBD WG)

APPENDIX I: Literature Cited

Carlson, Carole. 2003. Personal Communication. International Fund for Animal Welfare.
Ketten, Darlene. 2000.
Patenaude 2002.
Richardson 1995.
Scheifele, Peter 2003. Personal Communication. University of Connecticut.
Shadowing citation: In MMS 17(4):673-688: "Nowacek et al (2001) found that dolphins sometimes exhibit brief (<10s) avoidance behavior towards the airship's shadow; however, these occurrences are infrequent and responses are not consistent." Nowacek, D.P., P.L. Tyack, and R.S. Wells.2001. A platform for continuous behavioral and acoustic observation of free-ranging marine mammals: overhead video combined with underwater audio. MMS 17(1):191-199.

APPENDIX II: FAA Overflight Regulations

APPENDIX III: National Marine Sanctuary Program's Regulations

Gulf of the Farallones National Marine Sanctuary
"(5) Disturbing seabirds or marine mammals by flying motorized aircraft at less than 1000 feet over the waters within one NM of the Farallone Islands, Bolinas Lagoon, or any ASBS except to transport persons or supplies to or from the Islands or for enforcement purposes."

Monteray Bay National Marine Sanctuary
"(6) flying motorized aircraft, except as necessary for valid law enforcement purposes, at less than 1000 feet above any of the four zones within the Sanctuary described in appendix c to this subpart."

Hawaiian Islands Humpback National Marine Sanctuary
"(2) Operating any aircraft above the Sanctuary within 1,000 feet of any humpback whale except as necessary for takeoff or landing from an airport or runway, as authorized under the MMPA and the ESA."

Olympic Coast National Marine Sanctuary
"(6) Flying motorized aircraft at less than 2,000 feet both above the Sanctuary within one NM of the Flattery Rocks, Quilayute Needles, or Copalis National Wildlife Refuge, or within one NM seaward from the coastal boundary of the Sanctuary, except for activities related to tribal timber operations conducted on reservation lands, or to transport persons or supplies to or from reservation lands as authorized by a governing body of an Indian tribe."

APPENDIX VI: A Summary of National and International Guidelines and Regulations for Aircraft for Watching Whales and Dolphins (Submitted by Carole Carlson, International Fund for Animal Welfare)

USA

Northwest Region: Guidelines

- Aircraft include seaplanes, microlite and light aircraft. Aircraft must not approach closer than a height of 300 metres above a Whale.
- No aircraft may land on the water to Whale Watch. If an aircraft has to land in the vicinity of Whales a distance of 2,000 metres is required.
- The duration of a Whale encounter by aircraft is limited to five minutes or two approaches (sweeps).
- No more than one Whale Watching aircraft may be within five kilometers.
- Ban on helicopters for Whale Watching.

Alaska: Regulation

- Buzzing, hovering, landing, taking off, and taxiing near marine mammals on land or in the water are likely to result in harassment.
- Maintain a 1500 foot minimum altitude when viewing marine mammals from the air.

Southwest Region: Guidelines

- Aircraft should not fly lower than 1,000 feet while within a horizontal distance of 100 yards from a whale.

Hawaii: Regulations

- For humpback whales in Hawaii, federal regulations prohibit approaching closer than: 1000 feet (300 m) when operating an aircraft

Northern Right Whales: Regulation

- Buffer Zone. There is created a buffer zone surrounding a right whale which consists of an area outward from the right whale(s) a distance of 500 yards in all directions (as applies to whale watching).

INTERNATIONAL

Argentina: Regulations

- Do not operate lower than 150m over whales

Australia: General guidelines:

- Do not operate lower than 300m within a 300m radius on the slant of whales. This includes flying directly over and buzzing.
- Do not land on the water near whales
- Do not approach whales head on
- Helicopters are prohibited for whale or dolphin watching
- Helicopters in transit must be 1000m away from whales and not hover
- away (400 metres for jetskis).
- Fixed-wing aircraft, including ultralights and hang gliders, MUST not be flown closer than 300 metres (approx 1,000 ft) above or near a whale. Helicopters must not be flown closer, than 400 metres (approx 1,300 ft) above or near a whale.

Azores: Regulations

- Do not operate lower than 300m over whales

Brazil: Regulations

- Do not operate lower than 100m over whales

Canada: General Guidelines:
The droning of an airplane engine and especially the beating of a helicopter rotor will be detected by whales near the surface.

- Do not descend lower than 450 metres (1,000 feet) from the water.

Johnstone Strait, Canada: Guidelines

- Limit approaches to 450 metres above the water over whales.
- Do not hover over, circle around, or "buzz" the whales.

Dominica: Guidelines

- No aircraft shall be used to watch whales
- When operating at an altitude of less than 600 meters, no aircraft shall be closer than 500m horizontally from a point above any marine mammal unless in the process of taking off or landing.
- Ensure that you are more than 300 metres from whales before attempting landings or take-offs.
- Helicopters are prohibited from watching sperm whales

Dominican Republic: Regulations

- Flights of any nature cannot be made at height under 300m (1000feet) when at a maximum horizontal distance of 300m away from the whale.
- Hydroplane landing is not permitted in any area where a whale is present.

Japan: Guidelines

- Do not approach within 300 meters of targeted whales, regardless of approach angles, from an airplane or helicopter

New Zealand: Regulations

Marine Mammals

- When operating at an altitude less than 600 meters (2,000 feet), above sea level, no aircraft shall be closer than 150 meters (500 feet) horizontally from a point directly above any marine mammal or such lesser or greater distance as may be approved by the Director General, by notice in the *Gazette*, from time to time based on the best available scientific evidence
- Pilots of aircraft engaged in a commercial aircraft operation shall use their best endeavors to operate the aircraft in such a manner that without comprising safety, the aircraft's shadow is not imposed directly on any marine mammal.

Whales

- No vessel or aircraft shall approach within 300 meters (1,000 feet) of any whale for the purpose of enabling passengers to watch the whale, if the number of vessels or aircraft or both already positioned to enable passengers to watch that whale is 3 or more:
- Where 2 or more vessels or aircraft approach an unaccompanied whale, the masters concerned shall co-ordinate their approach and maneuvers, and the pilots ? concerned shall co-ordinate their approach and maneuvers:

Dolphins and seals

- No vessel or aircraft shall approach within meters (1,000 feet) of any pod of dolphins or herd of seals for the purpose of enabling passengers to watch the dolphins or seals, if the number of vessels or aircraft, or both, already positioned to enable passengers to watch that pod or herd is 3 or more:
- Where 2 or more vessels or aircraft approach an unaccompanied dolphin or seal, the masters concerned shall co-ordinate their approach and maneuvers, and the pilots concerned shall co-ordinate their approach and maneuvers

Puerto Rico: Regulations

- It is prohibited to observe whales from airplanes at less than 1,000 feet from sea level.

St. Lucia: Regulations

- No aircraft is to be used for marine mammal watching.

Tonga: Guidelines

- Aircraft include seaplanes, microlite and light aircraft. Aircraft must not approach closer than a height of 300 metres above a Whale.
- No aircraft may land on the water to Whale Watch. If an aircraft has to land in the vicinity of Whales a distance of 2,000 metres is required.
- The duration of a Whale encounter by aircraft is limited to five minutes or two approaches (sweeps).
- No more than one Whale Watching aircraft may be within five kilometers.
- Ban on helicopters for Whale Watching.

APPENDIX E: Appendix C: Emerging Issues

APPENDIX C

Emerging Issues

The working group identified a number of issues that may need to be addressed in the future, either because there is a potential increase in current activity in the Sanctuary or because activity does not currently occur, but may be proposed for the future. Research and management decisions regarding these issues should consider those currently proposed in other Behavioral Disturbance Action Plans.

- **Military vessels**. Military activities occur within the Sanctuary and with concerns about homeland security, traffic may increase. These operations present risk of collision or disruption of behavior. We assume that collision risk is being addressed by other working groups, but if not, we recommend that the SBNMS coordinate with NOAA Fisheries to document use of the Sanctuary and consult with the Department of Defense if necessary.

- **DOD Activities**. Military planes fly over the Sanctuary, and with concerns about homeland security, traffic may increase. Due to the recent amendment to the definition of harassment under the MMPA (Section 3), some military activities which might previously have been considered to be harassment may now be exempted. Therefore, we recommend that the SBNMS coordinate with NOAA to document military use of the Sanctuary and consult with the Department of Defense if necessary. See Exhibit: A National Defense Authorization Act.

- **High speed ferries**. With advancing technology, passenger ferries between Boston, the Massachusetts north shore, and Cape Cod have become faster and more numerous. This increased speed may pose a higher risk of collision or behavioral disruption because both operators and whales have reduced reaction time. We assume that collision risk is being addressed by other working groups, but if not, we recommend that the SBNMS coordinate with NOAA Fisheries to document this use and consider regulation.

- **Marine construction**. The noise of construction of any sort, including cable laying, installation of structures, laying of pipelines, etc., may pose a risk of behavioral disturbance to whales in the SBNMS. Proposals for construction of pipelines or erecting structures in or around the boundaries of the SBNMS require careful scrutiny to determine potential impacts on animals in the Sanctuary.

- **Dive boats**. As has happened in marine sanctuaries elsewhere, there is the potential for entrepreneurs to offer diving trips to Stellwagen Bank, either for viewing of archaeological sites or marine life. Should this type of operation be proposed, the SBNMS should be aware that it poses a risk of behavioral disruption of animals, and that regulation may be necessary.

- **Ocean Based Energy Generation**. With greater interest in alternative forms of energy generation, developers have begun to look to the ocean for siting energy generating plants (e.g. wind turbines, wave generating, etc). Because of the high use of Sanctuary waters by vessels, and because of the paucity of information on impacts of such facilities on marine ecosystems, any proposal to construct energy generating facilities in or near the Sanctuary should be viewed with great caution.

- **Emerging Fisheries**. With the decline of groundfish stocks and increased research into alternative fishing methodologies, there is the potential for experimental or permitted fisheries that seek to exploit new fishery niches. Some of the technologies may adversely affect marine

mammals. The SBNMS should be proactive in its consultation with NOAA fisheries regarding new proposed fisheries or shift in effort of existing fisheries that may take place within the boundaries of the Sanctuary.

- **Parasailing**. As has happened in marine sanctuaries elsewhere, there is the potential for entrepreneurs to offer parasailing trips on Stellwagen Bank. Because tow boats are limited in their maneuverability as they tow an aerial passenger, they may pose a risk of collision or disruption to nearby whales. Should this type of operation be proposed, the SBNMS should be aware that it poses a risk of behavioral disruption of animals, and that regulation may be necessary.

- **Whale watching planes**. In a number of national parks, aerial viewing of natural wonders has increased. Should such operations be proposed for SBNMS, operators would need careful scrutiny to assure that whales are not harassed. We note recommendations elsewhere in this report relative to recommended altitudes to avoid harassment.

- **Shadow Effects of Overflight**. Anecdotal evedence suggests that whales are startled, and their behavior disrupted, by shadows of aircraft passing over them. Low altitude use of tuna spotter planes, private aircraft and airships may cast shadows that disturb animals. We note recommendations elsewhere in this report relative to recommended altitudes to minimize this effect. The working group recommends that the Sanctuary conduct research on the shadow effects of overflight

- **Tuna Spotter Planes**. Tuna spotter planes sometimes target concentrations of humpback whales (because of their association with tuna, which presumably feed upon similar prey). However whales do not appear to be disturbed by these activities (Phil Clapham, personal communication). Typically, tuna spotters do not target specific individual whales and do not engage in the low-altitude, prolonged circling over whales that has been identified as a possible source of disturbance (i.e., from small planes engaged in whale-watching). Accordingly, it is our recommendation that tuna spotters be exempt from overflight restrictions.